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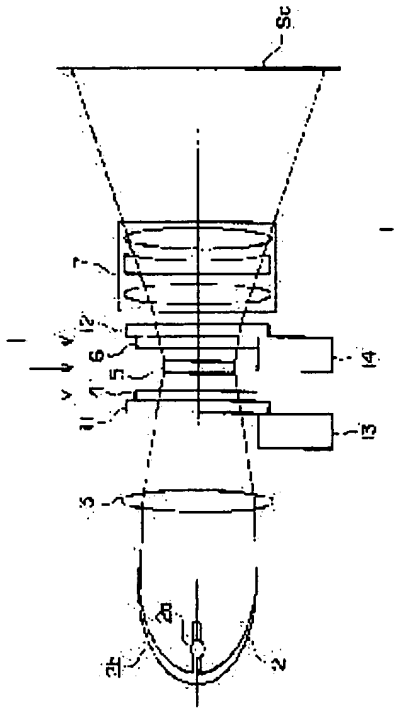
(54) PROJECTION DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a projection display device capable of efficiently releasing heat generated in polarizing plates, capable of achieving satisfactory cooling with a small volume of air and capable of suppressing the deterioration of the polarizing plates.
SOLUTION: The projection display device has a transmission liquid crystal panel 5 which modulates and emits illuminating light made incident according to inputted image information, a polarizing plate 4 as a polarizer disposed on the incident side of the panel 5, a polarizing plate 6 as an analyzer disposed on the emergent side of the panel 5, sapphire substrates 11, 12 as heat releasing members formed of a material transmitting the illuminating light and having high heat conductivity and joined separately to the entire surfaces of the polarizing plates 4, 6 and heat releasing parts 13, 14 connected separately to the substrates 11, 12 to release heat conducted from the substrates 11, 12.



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CLAIMS

[Claim(s)]
[Claim 1] The transparency mold liquid crystal panel which modulates and carries out outgoing radiation of the illumination light by which incidence is carried out based on the image information inputted, The polarizing plate as a polarizer arranged at the incidence side of said transparency mold liquid crystal panel, The polarizing plate as an analyzer arranged at the outgoing radiation side of said transparency mold liquid crystal panel, The projection mold display which has a heat dissipation means to emit the heat which said illumination light is penetrated, and it is formed with the ingredient of high temperature conductivity, connects with the member for heat dissipation extensively joined to the front face of one [at least] of said polarizing plate, and said member for heat dissipation, and is conducted from the member for heat dissipation concerned.
[Claim 2] It is the projection mold display according to claim 1 which said member for heat dissipation has an area larger than said polarizing plate, and is connected to a part for the non-connecting part by which said heat dissipation means is not joined to said polarizing plate of said member for heat dissipation.
[Claim 3] Said member for heat dissipation is a projection mold display according to claim 1 which is silicon on sapphire.
[Claim 4] Said heat dissipation means is a projection mold display according to claim 1 which it has further an attachment component with the attaching part holding the perimeter of said member for heat dissipation, and a part contacts said member for heat dissipation, and is being fixed to said attachment component.
[Claim 5] The projection mold display according to claim 4 with which the ingredient of high temperature conductivity intervenes between the contact surfaces of said heat dissipation means and said member for heat dissipation.
[Claim 6] The ingredient of said high temperature conductivity is a projection mold display according to claim 5 which is silicon grease.
[Claim 7] The ingredient of said high temperature conductivity is a projection mold display according to claim 5 which is a heat-conduction sheet.
[Claim 8] The projection mold display according to claim 4 with which the ingredient of high temperature conductivity intervenes between said attaching part and said member for heat dissipation.
[Claim 9] It is the projection mold display according to claim 1 with which it has further an attachment component with the attaching part holding the perimeter of said member for heat dissipation, and said heat dissipation means is formed in said attachment component in one.
[Claim 10] Said member for heat dissipation is a projection mold display according to claim 1 which consists of the 1st and 2nd members for heat dissipation joined to said each polarizing plate, respectively, and is connected to said heat dissipation means by which said 1st and 2nd members for heat dissipation are common.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to projection mold displays, such as a liquid crystal projector.
[0002]
[Description of the Prior Art] Projection mold displays, such as a liquid crystal projector, become irregular based on image information, and project the light from the light source on a screen through optical system. Drawing 10 is the outline block diagram showing an example of a transparency mold liquid crystal projector. In drawing 10 , a liquid crystal projector 101 has the light source 102, the illumination-light study system 103, the polarizing plate 104 as a polarizer, a liquid crystal panel 105, the polarizing plate 106 as an analyzer, and the incident light study system 107. The illumination-light study system 103 carries out incidence of the light from the light source 102 to a liquid crystal panel 105. The polarizing plate 104 arranged at the incidence side of a liquid crystal panel 105 chooses the linearly polarized light of the fixed direction from the illumination light by which incidence was carried out, and outputs it to a liquid crystal panel 105. A video signal SG is impressed, and a liquid crystal panel 105 rotates the polarization direction of the linearly polarized light by which incidence was carried out according to this video signal in a liquid crystal panel 105, and performs light modulation to it. The polarizing plate 106 arranged behind a liquid crystal panel 105 analyzes light the light modulated with the liquid crystal panel 105. Incidence of the light which passed the polarizing plate 106 is carried out to the incident light study system 107, and it projects the image of a liquid crystal panel 105 on a screen 108.
[0003] On the other hand, in order to realize high definition by high brightness, light is decomposed into three primary colors, it is required to become irregular, compound and carry out outgoing radiation to according to, respectively, and this is called 3 plate type projector. Drawing 11 is the outline block diagram of the optical system of 3 plate type transparency mold projector which uses the liquid crystal panel of three sheets. The transparency mold projector 201 shown in drawing 11 consists of the light source 202, a condenser lens 203, a dichroic mirror 204,205, the reflective mirror 207,206,208, polarizing plates 210R, 210G, and 210B, liquid crystal panels 211R, 211G, and 211B, polarizing plates 212R, 212G, and 212B, a dichroic prism 213, and incident light study system 209 grade. The color of the white light outputted from the light source 202 is separated into three wavelength bands of RGB with the back dichroic mirror 204,205 condensed with the condenser lens 203. Each colored light whose color was separated passes polarizing plates 210R, 210G, and 210B, respectively, and they carry out incidence to the corresponding liquid crystal panels 211R, 211G, and 211B and the polarizing plates 212R, 212G, and 212B as an analyzer. Each colored light which passed polarizing plates 212R, 212G, and 212B, respectively is again compounded with a dichroic prism 213, and is projected on a screen 215 by the incident light study system 209.
[0004]
[Problem(s) to be Solved by the Invention] By the way, in a liquid crystal projector as shown in drawing 10 and drawing 11 , the light which comes out of the light source is unpolarized light, when the case where it is laser is removed. For this reason, the polarizing plate as a polarizer absorbs 50% or more of quantity of light. For example, although unpolarized light is convertible for the linearly polarized light of an one direction to some extent by using a polarization sensing element, even if it uses a polarization sensing element, unpolarized light cannot necessarily be changed into the linearly polarized light 100%, and the light absorption in the polarizing plate which is an analyzer exists. Moreover, when light does not go to a screen screen (i.e., when all screens are black displays), all the light that carried out outgoing radiation of the liquid crystal panel is absorbed with the

polarizing plate which is an analyzer, and a polarizing plate generates heat. Thus, in addition to incidence of the light of high brightness being carried out, a polarizing plate serves as an elevated temperature by absorbing light as mentioned above. For this reason, a polarizing plate has the problem of being easy to deteriorate.
[0005] For this reason, in the liquid crystal projector using a transparency mold liquid crystal panel, in order to prevent degradation of a polarizing plate, compulsory cooling of the polarizing plate placed before and after a liquid crystal panel is needed. Especially, the projector is asked for the demand of the further raise in brightness and miniaturization, therefore the light source with the big amount of luminescence and a small liquid crystal panel are used more often in recent years, and the brightness of the light impressed to a polarizing plate tends to increase, and needs to enlarge airflow of the air cooling fan for cooling of a polarizing plate. However, if airflow of the air cooling fan for cooling of a polarizing plate is enlarged, a fan noise will increase and power consumption will also increase. For this reason, a polarizing plate can be cooled with the smallest possible airflow, and the technique which can prevent degradation of a polarizing plate is searched for.
[0006] This invention is accomplished in view of an above-mentioned problem, can emit efficiently the heat generated in a polarizing plate, can perform cooling sufficient with small airflow, and aims at offering the projection mold display which can control degradation of a polarizing plate.
[0007]
[Means for Solving the Problem] The transparency mold liquid crystal panel which the projection mold display of this invention modulates the illumination light by which incidence is carried out based on the image information inputted, and carries out outgoing radiation, The polarizing plate as a polarizer arranged at the incidence side of said transparency mold liquid crystal panel, The polarizing plate as an analyzer arranged at the outgoing radiation side of said transparency mold liquid crystal panel, Said illumination light is penetrated, and it is formed with the ingredient of high temperature conductivity, connects with the member for heat dissipation extensively joined to the front face of one [at least] of said polarizing plate, and said member for heat dissipation, and has a heat dissipation means to emit the heat conducted from the member for heat dissipation concerned.
[0008] Said member for heat dissipation has an area larger than said polarizing plate, and said heat dissipation means is connected to a part for the non-connecting part which is not joined to said polarizing plate of said member for heat dissipation.
[0009] Suitably, said member for heat dissipation is silicon on sapphire.
[0010] The projection mold display of this invention has further an attachment component with the attaching part holding the perimeter of said member for heat dissipation, and said a part of heat dissipation means contacts at said member for heat dissipation, and it is fixed to said attachment component.
[0011] Suitably, the ingredient of high temperature conductivity intervenes between the contact surfaces of said heat dissipation means and said member for heat dissipation.
[0012] The ingredient of said high temperature conductivity is silicon grease.
[0013] The ingredient of said high temperature conductivity can also use a heat-conduction sheet.
[0014] Between said attaching part and said member for heat dissipation, the ingredient of high temperature conductivity intervenes still more suitably.
[0015] The projection mold display of this invention has further an attachment component with the attaching part holding the perimeter of said member for heat dissipation, and said heat dissipation means is formed in said attachment component in one.
[0016] Said member for heat dissipation consists of the 1st and 2nd members for heat dissipation joined to said 1st and 2nd polarizing plates, respectively, and said 1st and 2nd members for heat dissipation are connected to said common heat dissipation means.
[0017] In this invention, the heat generated in the polarizing plate conducts efficiently, without interrupting the illumination light by joining extensively the member for heat dissipation of high temperature conductivity which penetrates the illumination light on the surface of a polarizing plate. The heat conducted to the member for heat dissipation is efficiently emitted by the heat dissipation means. Moreover, in this invention, silicon on sapphire is used as a member for heat dissipation. Silicon on sapphire is one of the ingredients which penetrate light of an ingredient with the highest thermal conductivity. However, machining is difficult for silicon on sapphire, and it is difficult for it to process the hole for conclusion of a screwhole etc., although a heat dissipation means is fixed to silicon on sapphire. For this reason, in this invention, it fixes to a heat dissipation

means at the attachment component which holds the perimeter of silicon on sapphire by the attachment component, and silicon on sapphire and a heat dissipation means are considered as the configuration which a part contacts.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.

1st operation gestalt drawing 1 is drawing showing the outline configuration of the projection mold display concerning the 1st operation gestalt of this invention. The projection mold display 1 shown in drawing 1 has the light source 2, the illumination-light study system 3, the polarizing plate 4 as a polarizer, a liquid crystal panel 5, the polarizing plate 6 as an analyzer, the incident light study system 7, the silicon on sapphire 11 and 12 joined to polarizing plates 4 and 6, respectively, and the radiator material 13 and 14 connected to silicon on sapphire 11 and 12, respectively. In addition, silicon on sapphire 11 and 12 is one embodiment of the member for heat dissipation of this invention, and the radiator material 13 and 14 is one embodiment of the heat dissipation means of this invention.

[0019] The light source 2 consists of discharge lamp 2a and reflective converging-mirror 2b. A halogen lamp, an extra-high pressure mercury lamp, etc. are used, and discharge lamp 2a emits the illumination light in response to predetermined power from the power source which is not illustrated. Reflective converging-mirror 2b is equipped with the reflector formed in the paraboloidal shape, reflects the illumination light emitted from discharge lamp 2a in this reflector, condenses, and carries out outgoing radiation to the illumination-light study system 3 as an abbreviation parallel light.

[0020] The illumination-light study system 3 is formed in order to illuminate light equally spatially to a liquid crystal panel 5, and in order to illuminate a liquid crystal panel 5 by uniform luminous-intensity distribution, it makes uniform spatially outgoing radiation light of a reflective converging mirror.

[0021] A polarizing plate 4 chooses the linearly polarized light of the fixed direction among the illumination light which carries out incidence through the illumination-light study system 3 and the silicon on sapphire 11 mentioned later, and outputs it to a liquid crystal panel 5. At this time, the illumination light which carries out incidence through the illumination-light study system 3 is unpolarized light. For this reason, a polarizing plate 4 absorbs 50% or more of quantity of light, and generates heat.

[0022] A video signal is impressed and a liquid crystal panel 5 modulates the reinforcement of the illumination light which passed the polarizing plate 4. That is, based on the video signal impressed to the liquid crystal panel 5, plane of polarization rotates the light of the predetermined polarization direction which penetrated the polarizing plate 4.

[0023] A polarizing plate 6 analyzes light the light modulated with the liquid crystal panel 5. Incidence of the light which passed the polarizing plate 6 is carried out to the incident light study system 7 through the silicon on sapphire 12 mentioned later, and it projects the image of a liquid crystal panel 5 on Screen Sc. The light which does not pass a polarizing plate 6 among the light which passed the liquid crystal panel 5 is absorbed by the polarizing plate 6. For this reason, a polarizing plate 6 generates heat.

[0024] In addition, since polarizing plates 4 and 6 generate heat as described above, they need to cool this. For this reason, in the projection mold display 1, it has the air cooling fan which supplies the air for cooling and which is not illustrated from the direction which met the polarizing plates 4 and 6 shown by the arrow head in drawing 1 .

[0025] Silicon on sapphire 11 and 12 is joined to polarizing plates 4 and 6, respectively. This silicon on sapphire 11 and 12 penetrates the illumination light from the light source 2. Moreover, silicon on sapphire 11 and 12 is one of the ingredients which penetrate light of an ingredient with the highest thermal conductivity.

[0026] The radiator material 13 and 14 is being fixed to silicon on sapphire 11 and 12, respectively. This radiator material 13 and 14 consists of heat sinks formed with the ingredient of high temperature conductivity of an aluminium alloy etc. Like the heat sink formed with the aluminium alloy etc., the heat which conducts silicon on sapphire 11 and 12 can be promptly emitted outside by making the radiator material 13 and 14 into what has big heat capacity. Moreover, when using a heat sink, it is desirable to form many fins and to make surface area of a heat sink larger than the surface area of silicon on sapphire 11 and 12.

[0027] Drawing 2 (a) is a plan, drawing 2 and drawing 3 are drawings showing the arrangement relation between silicon on sapphire 11 and 12, the radiator material 13 and 14, and polarizing plates 4 and 6, and

drawing 2 (c) is [drawing 2 (b) is a front view and] a side elevation. Moreover, drawing 3 is a perspective view. As shown in drawing 2 and drawing 3 , silicon on sapphire 11 and 12 is a rectangle-like plate, and has an area larger than polarizing plates 4 and 6. Polarizing plates 4 and 6 are extensively joined to the abbreviation center section of the whole surface of silicon on sapphire 11 and 12. Therefore, heat is transmitted from the whole surface of the whole surface of polarizing plates 4 and 6 to silicon on sapphire 11 and 12. It has pasted up with transparent adhesives between silicon on sapphire 11 and 12 and polarizing plates 4 and 6.

[0028] The non-joining field which is not joined to the polarizing plates 4 and 6 of the periphery of silicon on sapphire 11 and 12 is a field as for which the illumination light does not carry out incidence. A part of radiator material 13 and 14 is connected to this non-joining field. Since the thermal conductivity from silicon on sapphire 11 and 12 to the radiator material 13 and 14 is raised, the adhesives 50 which consist of an ingredient of high temperature conductivity can be made to intervene between silicon on sapphire 11 and 12 and the radiator material 13 and 14, as shown in drawing 4 . As these adhesives 50, silicon grease can be used, for example. Moreover, the thing of high temperature conductivity of for example, a heat-conduction sheet etc. can also be used besides silicon grease.

[0029] In the projection mold display 1 of the above-mentioned configuration, polarizing plates 4 and 6 generate heat by the absorption of light by the exposure of the illumination light from the light source 2. The heat generated in polarizing plates 4 and 6 is conducted to silicon on sapphire 11 and 12. At this time, since polarizing plates 4 and 6 are extensively joined to silicon on sapphire 11 and 12, conduction of the heat from polarizing plates 4 and 6 to silicon on sapphire 11 and 12 is performed efficiently.

[0030] The heat conducted to silicon on sapphire 11 and 12 gets across to the radiator material 13 and 14 with large heat capacity promptly. The radiator material 13 and 14 emits efficiently outside the heat conducted from silicon on sapphire 11 and 12 by the wind from the air cooling fan which was built in the projection mold display 1 and which is not illustrated.

[0031] With this operation gestalt, the heat generated with polarizing plates 4 and 6 can be quickly moved to the radiator material 13 and 14 through the silicon on sapphire 11 and 12 of high temperature conductivity as mentioned above, and the temperature rise of polarizing plates 4 and 6 can be controlled. Consequently, sufficient cooling of polarizing plates 4 and 6 is attained with small airflow, and degradation of polarizing plates 4 and 6 can be controlled. In addition, since the airflow of an air cooling fan can be reduced, generating of the noise from an air cooling fan can be controlled.

[0032] 2nd operation gestalt drawing 5 is the outline block diagram of the projection mold display concerning the 2nd operation gestalt of this invention. In addition, in drawing 5 , the same sign is attached about the same component as the projection mold display 1 concerning the 1st operation gestalt mentioned above. Unlike the projection mold display 1 concerning the 1st operation gestalt which mentioned only the radiator material 15 above, the projection mold display 301 shown in drawing 5 is the same about other configurations. The radiator material 15 of the projection mold display 301 consists of heat sinks formed with the ingredient of high temperature conductivity of an aluminium alloy etc. This radiator material 15 is connected common to the silicon on sapphire 11 and 12 of two sheets. Moreover, it connects through the ingredient of high temperature conductivity of silicon grease etc. between the radiator material 15, and silicon on sapphire 11 and silicon on sapphire 12.

[0033] The radiator material 15 can be miniaturized by connecting silicon on sapphire 11 and 12 to the common radiator material 15. As especially shown in drawing 5 , polarizing plates 4 and 6 have sandwiched the liquid crystal panel 5 in between, and since distance is comparatively short, connecting silicon on sapphire 11 and 12 to the common radiator material 15 in common can be easily realized between silicon on sapphire 11 and silicon on sapphire 12.

[0034] 3rd operation gestalt drawing 6 is the perspective view showing the surrounding structure of the polarizing plates 4 and 6 of the projection mold display concerning the 3rd operation gestalt of this invention. In addition, the same sign is attached about the same component as the operation gestalt mentioned above. In drawing 6 , the silicon on sapphire 11 to which the polarizing plate 4 was joined is held by the holder member 20. In addition, it shall be held by other holder members 20 also about a polarizing plate 6 and silicon on sapphire 12.

[0035] The holder member 20 is equipped with attaching part 20a holding the perimeter of silicon on sapphire 11. This attaching part 20a is equipped with the three directions of the periphery of silicon on sapphire 11, and

the maintenance side which counters, respectively.
[0036] Adhesives intervene between attaching part 20a of the holder member 20, and the peripheral face of silicon on sapphire 11, and silicon on sapphire 11 is certainly being fixed to the holder member 20.
[0037] As the holder member 20 is formed with metals, such as for example, PURASUKKU resin and an aluminium alloy, and it is shown in drawing 7 under this holder member 20, two or more screw-thread hole 20b penetrated from a field to an another side side on the other hand is formed.
[0038] As shown in drawing 6 , maintenance immobilization of the radiator material 21 is carried out at the holder member 20 with the bolt 22 screwed in the above-mentioned screw-thread hole 20b. The heat sink formed from the metallic material of high temperature conductivity of an aluminium alloy etc. can be used for this radiator material 21 like the operation gestalt mentioned above. A part of radiator material 21 touches the non-joining field of the lower part of the liquid crystal panel 4 of silicon on sapphire 11. In addition, the ingredient of high temperature conductivity of for example, silicon grease etc. can be made to be placed between the parts which the radiator material 21 and silicon on sapphire 11 contact.
[0039] As the configuration which connects silicon on sapphire 11 and the radiator material 21 with adhesives with the 1st and 2nd operation gestalten mentioned above. However, it is difficult as a realistic problem to connect firmly silicon on sapphire 11 and the radiator material 21 depending on ingredients, such as silicon grease. In order to connect mechanically silicon on sapphire 11 and the radiator material 21 using conclusion means, such as ****, it ****s to silicon on sapphire 11, and a hole etc. must be machined. However, since silicon on sapphire 11 is a hard and weak ingredient, machining is difficult for it. For this reason, with this operation gestalt, it is considering as the configuration in which the radiator material 21 is not fixed to silicon on sapphire 11, the radiator material 21 is fixed to the holder member 20 holding the perimeter of silicon on sapphire 11, and a part of radiator material 21 is contacted to silicon on sapphire 11.
[0040] According to the above-mentioned configuration, the heat generated from the polarizing plate 4 conducts silicon on sapphire 11, and is promptly emitted to the radiator material 21 with large heat capacity from propagation and the radiator material 21. As mentioned above, silicon on sapphire 11 and the radiator material 21 can certainly be fixed to fixed arrangement, without machining to the silicon on sapphire 11 joined to the polarizing plate 4 according to this operation gestalt.
[0041] 4th operation gestalt drawing 8 is the perspective view showing the surrounding structure of the polarizing plates 4 and 6 of the projection mold display concerning the 4th operation gestalt of this invention. In addition, the same sign is attached about the same component as the operation gestalt mentioned above. As shown in drawing 8 , the silicon on sapphire 11 to which the polarizing plate 4 was joined is held by the holder member 30. In addition, it shall be held by other holder members 30 also about a polarizing plate 6 and silicon on sapphire 12.
[0042] The holder member 30 is equipped with attaching part 30a holding the perimeter of silicon on sapphire 11. This attaching part 30a is equipped with the three directions of the periphery of silicon on sapphire 11, and the maintenance side which counters, respectively.
[0043] Between attaching part 30a of the holder member 30, and the peripheral face of silicon on sapphire 11, the highly thermally-conductive materials 24, such as silicon grease, intervene, and maintenance immobilization of the silicon on sapphire 11 is carried out certainly at the holder member 30. The holder member 30 is formed with the metallic material of high temperature conductivity of an aluminium alloy etc., and fin 30b for much heat dissipation is formed in the front face. That is, the holder member 30 serves as the heat dissipation means while being an attachment component holding silicon on sapphire 11.
[0044] The heat generated with the polarizing plate 4 conducts silicon on sapphire 11 to the holder member 30 through propagation and a highly thermally-conductive material 24. From it being the attachment component to hold, the holder member 30 can have surface area large enough, and can emit heat efficiently. Moreover, space-saving-ization can be attained by unifying the attachment component and heat dissipation means of silicon on sapphire 11 in this way.
[0045] 5th operation gestalt drawing 9 is the outline block diagram of the projection mold display concerning the 5th operation gestalt of this invention. Although the projection mold indicating equipment concerning each operation gestalt mentioned above explained the case of the so-called veneer type projector, this invention is applicable also to 3 plate type projector. The projection mold indicating equipment 401 shown in drawing 9 is 3 plate type projector, and the fundamental configuration of it is the same as that of the projection mold indicating

equipment explained in drawing 11 . The projection mold display 401 shown in drawing 9 consists of the light source 202, a condenser lens 203, a dichroic mirror 204,205, the reflective mirror 207,206,208, polarizing plates 210R, 210G, and 210B, liquid crystal panels 211R, 211G, and 211B, polarizing plates 212R, 212G, and 212B, a dichroic prism 213, and incident light study system 209 grade. The color of the white light outputted from the light source 202 is separated into three wavelength bands of RGB with the back dichroic mirror 204,205 condensed with the condenser lens 203. Each colored light whose color was separated passes polarizing plates 210R, 210G, and 210B, respectively, and they carry out incidence to the corresponding liquid crystal panels 211R, 211G, and 211B and the polarizing plates 212R, 212G, and 212B as an analyzer. Each colored light which passed polarizing plates 212R, 212G, and 212B, respectively is again compounded with a dichroic prism 213, and is projected on a screen 215 by the incident light study system 209.

[0046] In drawing 9 , it prepares corresponding to each color of RGB. To an incidence [of the **** liquid crystal panels 211R, 211G, and 211B], and outgoing radiation side Polarizing plates 210R, 210G, and 210B and polarizing plates 212R, 212G, and 212B are arranged, respectively. These six polarizing plates 210R, 210G, 210B, 212R, 212G, and 212B are joined to silicon on sapphire 11R, 11G, 11B, 12R, 12G, and 12B like the operation gestalt mentioned above.

[0047] Furthermore, the radiator material 25 shown by the dotted line in drawing 9 is being fixed to the top face of the color-separation prism 213, or the inferior surface of tongue, i.e., the field as for which each colored light does not carry out incidence. This field is a field along the flat surface at which each component part of the optical system of a projection mold display is arranged. Although this radiator material 25 is not specifically illustrated, it touches the non-joining field of silicon on sapphire 11R, 11G, 11B, 12R, 12G, and 12B.

[0048] In 3 plate type projector, by connecting six polarizing plates to the same radiator material 25, and fixing this radiator material 25 to the top face or inferior surface of tongue of the color-separation prism 213, the radiator material 25 can be arranged along the field along the flat surface at which each component part is arranged, and, according to the configuration of this operation gestalt, the big heat dissipation means of area can be constituted. Since it can have big heat capacity and many surface areas can also be taken, it can cool easily.

[0049]

[Effect of the Invention] According to this invention, in a transparency mold liquid crystal projector, it becomes possible to fully cool a polarizing plate with small airflow. Consequently, degradation of a polarizing plate can be controlled and the life of a polarizing plate can be lengthened. Moreover, the equipment of the low noise is realizable from the ability also of airflow of an air cooling fan to be lessened.

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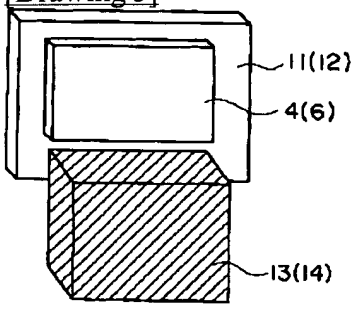
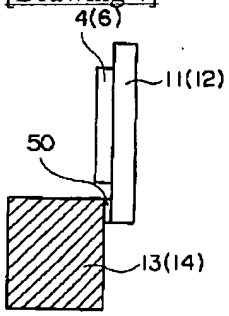
DRAWINGS

[Drawing 3]



[Drawing 4]



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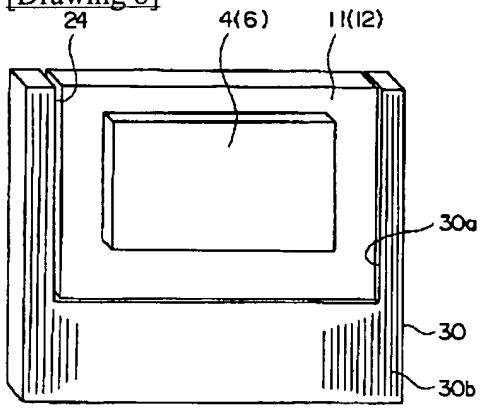
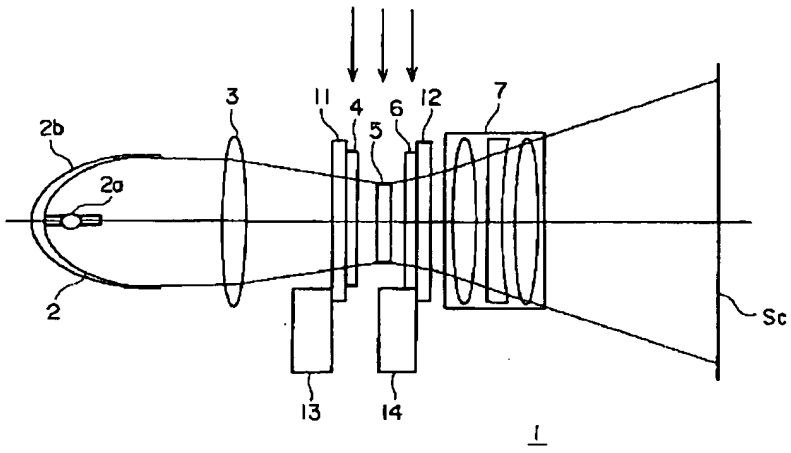


[Drawing 1]



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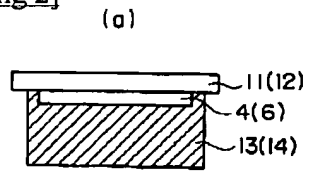
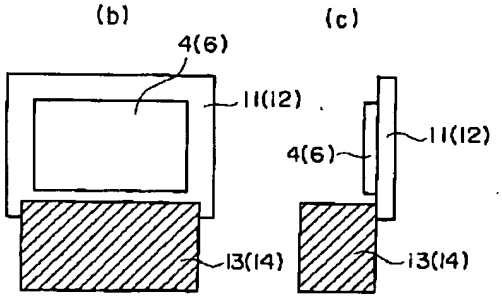
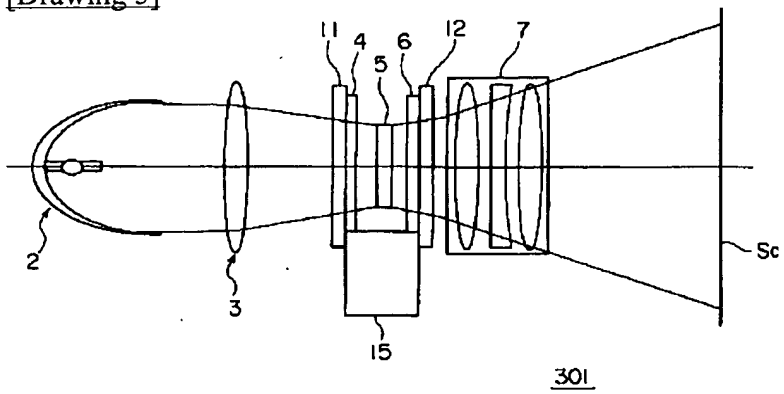
[Drawing 2]



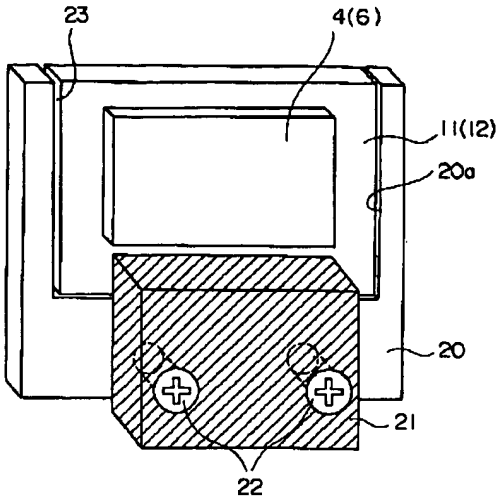


[Drawing 5]

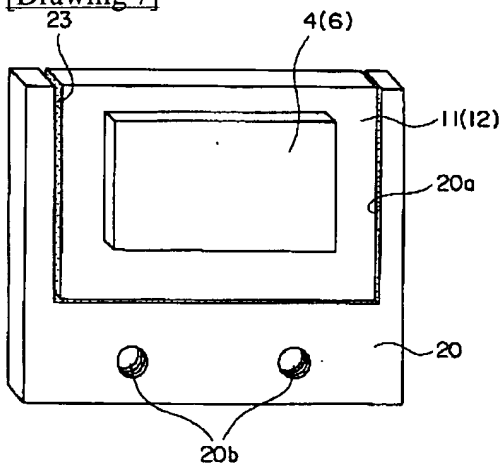


301

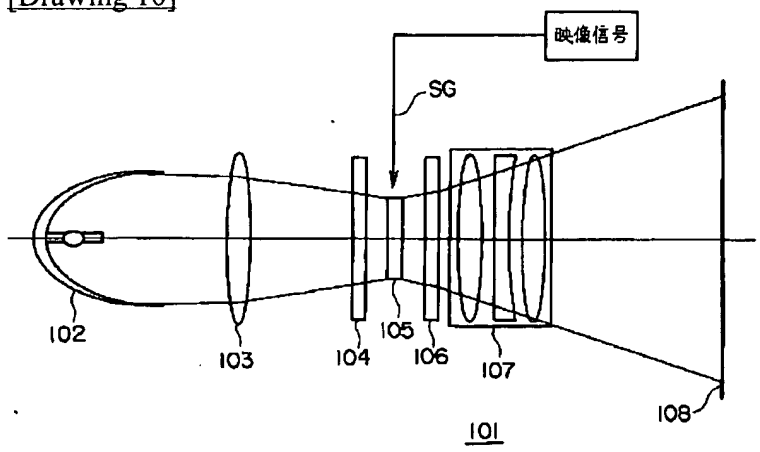
[Drawing 6]



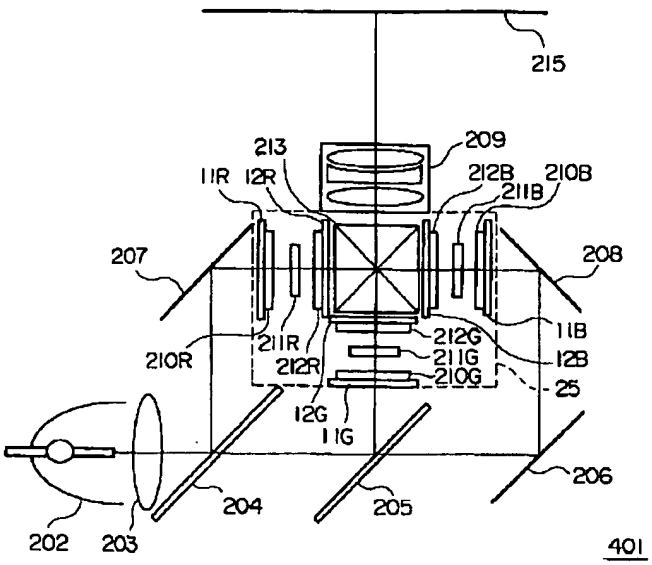
[Drawing 7]



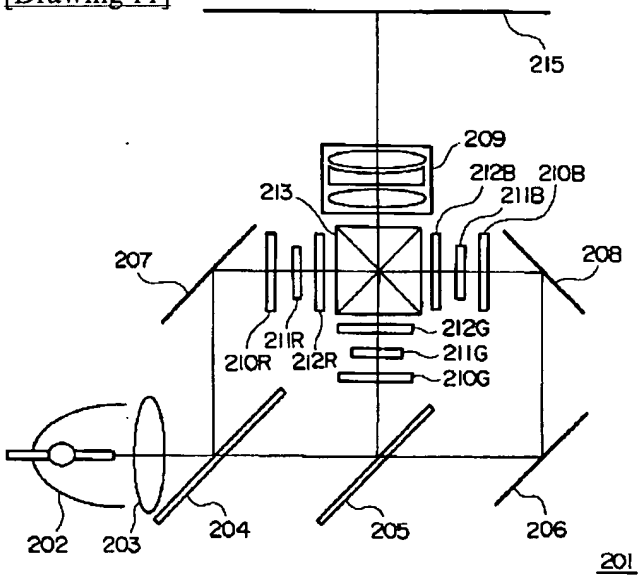
[Drawing 10]



[Drawing 9]



[Drawing 11]



[Translation done.]